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Sent: Monday, July 16, 2001 1:14 PM
Subject: Cooling System Meeting Summary

Hi All,

Here is a summary of the fitting tests that we settled on at the meeting last thursday, and some information I have calculated about system pump-down. First of all, following are the fitting tests we agreed on to qualify all seals in the pixel volume:

- 1.) He vacuum leak check (quantitative)
- 2.) 10 bar proof test (visual, assure that fitting doesn't mechanically explode, no more than 1 minute)
- 3.) 4 bar He pressurized leak check at 0 Celsius (quantitative)
- 4.) 1 bar He pressurized leak check at -35 Celsius (quantitative)
- 5.) He vacuum leak check (quantitative)
- 6.) Thermally cycle fitting assembly 50 times (20 to -50 C)
- 7.) Repeat tests 1,3,4,5 (all quantitative, in that order)
- 8.) Pressure cycle fitting assembly 50 times (1 to 4 bar)
- 9.) Repeat tests 1,3,4,5 (all quantitative, in that order)

Each potential seal type must have at least 10 specimens to run through the above sequence. If plastic seals are considered (as at LBNL) then an additional 10 fittings must undergo the same tests after irradiation, in order to compare with the control group.

As for the test requirements, we arrived at the following numbers:

- 1.) Permanent connections (welds, etc.) vacuum leak check to $1\text{e-}7$ atm-cc/sec He.
- 2.) Seal leak rates under vacuum are $3\text{e-}5$ atm-cc/sec He.
- 3.) Seal leak rates at 4 bar are $1\text{e-}4$ atm-cc/sec He.

In order to determine if the system conductance is high enough to pump down to initial vacuum (before introducing C3F8), I calculated a *rough estimate* of the conductance and pressure for given fitting leak rates. I assumed 10 fittings per circuit, equal leak rates for all fittings, and a lumped global system conductance (meaning that all pipes and sizes are considered, but they are all lumped into one series conductance or resistance). This may be an optimistic estimate, so I am currently in the process of making a more exact calculation. I have attached a preliminary graph of my estimates, which shows that for the leak rate we

propose for seals ($3e-5$), we will arrive at a minimum system pressure (in the capillary) of more than 175 microbar. I am unsure if this is acceptable, so I would like some feedback on your thoughts. I will circulate more info as soon as I do some more exact calculations, however, I will not be back in the US until next week to do this.

Please, if you have comments, don't hesitate to share them.

Regards,
Neal